

## COREF Project Toward understanding responses of coral reefs to Quaternary climate changes

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The COREF Project involves ocean and land scientific drilling into Quaternary reef deposits in different settings in the Ryukyu Islands. Major scientific objectives are to examine the following questions:

- (1) What are the nature, magnitude, and driving mechanisms of coral-reef front migration in the Ryukyus?
- (2) What is the ecosystem response of coral reefs in the Ryukyus to Quaternary climate changes?
- (3) What is the role of coral reefs in the global carbon cycle?

Secondary objectives include

- (i) the timing and causes of coral-reef initiation in the Ryukyus,
- (ii) the position of the Kuroshio Current during glacial periods and its effects on coral-reef formation, and
- (iii) early carbonate diagenetic responses as a function of compounded variations in climate, eustacy, and depositional mineralogies (subtropical aragonitic to warm-temperate calcitic).

To accomplish the objectives mentioned above, it is crucial to clarify the stratigraphic succession and configuration of lithofacies of the Quaternary reef-complex deposits and to collect continuous samples from the carbonates which formed at glacial as well as interglacial periods throughout the Ryukyu Islands. The carbonates are distributed on extensive areas ranging from ~200 m in elevation on islands down to ~-150 m (or more) in depth on shelves to shelf slopes. Surface exposures are limited by luxuriant growth of tropical rain forests and intensive land-use by Ryukyu people (~1.5 million). Consequently, land drilling (ICDP) combined with ocean drilling (IODP) is only the way to obtain target materials efficiently.

We selected nine drill sites on transects along and across the Ryukyu Island Arc. The northeast-southwest transect along the Ryukyu Island Arc extends from 24 degree N (south Iriomote-jima) to 31 degree N (west of Tane-ga-shima), covering islands from subtropical to warm-temperate regions. The northernmost site is located on the northern limit of the modern coral-reef formation. At present, the distance between areas characterized by reefal coral communities and those by non-reefal coral communities (midway between Amami-o-shima Island and Tane-ga-shima Island) is approximately 150 km. Therefore, the drilling sites on the northeast-southwest transect were designed to be located within an interval less than 200 km. Drilling on this transect will provide information on the nature and magnitude of coral-reef front migrations between glacial and interglacial periods. The northwest-southeast transects across the Ryukyu Island Arc are located near Amami-o-shima, Okinawa-jima, and Miyako Islands. These drilling sites are located from proximal (reef) via distal (offreef) parts of ancient carbonate factories to shelf slopes toward the Okinawa Trough and the Ryukyu Trench. These drilling transects will recover a complete stratigraphic succession of the Quaternary carbonate deposits in the Ryukyus at different latitudes.